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BWP Grade Bamboo Mat-Veneer Composite Board — Specification

ICS 79.060.99

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April 2022 **Price Group 5**

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Wood and Other Lignocellulosic Products Sectional Committee had been approved by the Civil Engineering Division Council.

Bamboo mat-veneer composite board is manufactured with a combination of bamboo mat and veneer. Bamboo mats required for the manufacture of bamboo mat-veneer composite board shall be woven in herringbone pattern from slivers of uniform thickness and width. In the present scenario, where availability of conventional timber has been reduced to considerable extent this bamboo mat-veneer composite board is expected to find extensive use in future for wide range of applications. An Indian Standard specification has already been formulated for bamboo mat-veneer composite for general purposes as IS 14588 : 1999 'Bamboo mat-veneer composite for general purposes — Specification'. The product is now being used for different purposes as building components in various type of buildings. This standard has therefore, been formulated to guide the manufacturers and users of BWP (Boiling Water Proof) grade bamboo mat-veneer composite board for weather exposed surfaces of building components of various types of buildings and for decorative purposes.

In the formulation of this standard, considerable assistance has been rendered by Indian Plywood Industries Research and Training Institute, Bengaluru.

A scheme of labelling environment friendly products known as ECO-Mark has been instituted at the instance of the Ministry of Environment, Forests and Climate Change, Government of India. The ECO-Mark is administered by the Bureau of Indian Standards (BIS) under the *Bureau of Indian Standards Act*, 2016 as per the Resolution No.71 dated 21 February 1991 and Resolution No. 425 dated 20 October 1992 published in the Gazette of the Government of India. For a product to be eligible for ECO-Mark, it shall also carry the Standard Mark (ISI mark) of BIS besides meeting additional environment friendly requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the ISI Mark and the ECO-Mark logo. Requirements to be satisfied for a product to qualify for the BIS Standard Mark for eco friendliness, will be optional. Manufacturing units will be free to opt for ISI Mark alone also.

The ECO-Mark criteria is based on the Gazette Notification No. 170 dated 16 May 1996 for wood substitutes as environment friendly products published in the Gazette of Government of India, as revised/amended from time to time.

The Committee responsible for the preparation of this standard is given at Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test of analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

BWP GRADE BAMBOO MAT-VENEER COMPOSITE BOARD — SPECIFICATION

1 SCOPE

This standard covers the requirements of boiling water proof (BWP) grade bamboo mat-veneer composite board used for weather exposed surfaces of building components of various types of buildings and for decorative purposes.

2 REFERENCES

The standards given in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standard indicated at Annex A.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 707, IS 6874, IS 13958 and 14588 shall apply.

4 MATERIALS

4.1 Adhesive

Adhesive for bonding of bamboo mat and veneer shall be of phenolic type conforming to BWP grade specified in IS 848.

4.2 Bamboo

Any suitable species of bamboo may be used for making bamboo mat-veneer composite board. For ECO-Mark, bamboo mats shall be made from bamboo from sources other than natural forests.

4.3 Veneer

Any species of timber may be used for manufacture of veneers. For ECO-Mark, only species of wood other than natural forests, shall be used for the manufacture.

5 MANUFACTURE

5.1 Bamboo Mats

Bamboo mats required for the manufacture of bamboo mat-veneer composite board shall be woven in herringbone pattern from slivers of uniform thickness and width. Thickness of slivers shall not be less than 0.5 mm and width shall be in the range of 5 mm to 25 mm. Care shall be taken to exclude the slivers with epidermal and endodermal layer. Presence of epidermal layer up to a maximum of 10 percent of the width of the sliver and only on either edge shall be permitted.

5.1.1 *Prophylactic Treatment*

If the storage time including the time of transportation is one month or more, the mats shall be given prophylactic treatment as per Group 9 in Table 2 of IS 401 and IS 1902.

5.2 Veneer

Veneer shall be either rotary cut or sliced. The veneers shall be sufficiently smooth to permit an even spread of adhesive. The surface quality requirement of veneers shall conform to the requirements given in Table 1 of IS 303. However, the maximum number of categories of defects permitted on the surface of the veneer used for faces shall be restricted to the requirements laid down in Table 2 of IS 303. Treatment as specified in **5.2.1** shall be given at the veneer stage.

5.2.1 *Treatment*

Veneers of non-durable species shall be soaked in 1.25 percent solution of boric acid or 1.0 percent solution of borax at a temperature of 85 °C to 90 °C for a period of 10 to 40 min depending upon the thickness of the veneers or the veneers shall be dipped in 2.0 percent solution of boric acid or 3 percent borax solution for 2 min and stacked at least for 2 h. Alternatively, the veneers shall be soaked at the ambient temperature in a mixture of 0.5 percent solution of sodium pentachlorophenate and 1.5 percent of borax in water for a period of 2 min and then stacked for at least half an hour before drying.

5.2.2 *Thickness*

The thickness of all veneers shall be uniform within a tolerance of 5 percent.

5.2.3 *Joints in Veneers*

Veneers that require to be joined to form a ply shall be spliced before assembly. All joints shall be cut square. In assembly, joints in veneers running in the same direction shall be staggered.

5.3 Application of Adhesive

Adhesive shall be applied by soaking the mats in the adhesive as explained in **4.3**. A second coat of adhesive shall be applied on the soaked and dried mats which are used as outer layers, using a mechanical glue spreader. However, veneers shall be coated with the adhesive using mechanical spreader.

5.4 Conditioning of Adhesive Coated Bamboo Mats and Veneers

Adhesive coated mats and veneers shall be conditioned to bring down the moisture content to 12 percent with tolerance of 2 percent.

5.5 Assembly

Adhesive coated and conditioned mats and veneers shall be assembled between two aluminium caul plates whose surfaces are coated with releasing agent. Care shall be taken to ensure that:

a) On either side of the central ply same species and thickness is used to get balanced construction,
b) The grain direction of the outermost veneer from the centre ply shall be along the larger dimension of the panel, and
c) When two veneers are used adjacent to each other the grain direction of the veneers shall be at right angles to each other.

5.6 Hot Pressing

Assembly of the adhesive coated mats and veneers shall be hot pressed at 140 ºC to 145 ºC at a specific pressure of 1.5 N/mm^2 to 1.7 N/mm^2. Hot pressing time shall depend on the thickness of the board.

5.7 Preservative Treatment

Preservative treatment shall be given by incorporating suitable preservatives like sodium pentachlorophenate or boron (octoborate or tetraborate) or any other suitable preservative chemical into the resin before soaking/spreading the mats/veneers with adhesive as the case may be to protect against biodegradation.

NOTE — In case of any other suitable preservative chemical, the name of the preservative shall be declared by the manufacturer.

5.8 Moisture Content

After hot pressing, the finished bamboo mat-veneer composite board shall be conditioned to moisture content not less than 5 percent and not more than 15 percent.

6 DIMENSIONS AND TOLERANCE

6.1 When tested in accordance with IS 2380 (Part 2), the dimensions of BWP grade bamboo mat board shall be as follows:

2440 mm × 1220 mm, 1840 mm × 1220 mm, 2140 mm × 1220 mm, 1840 mm × 920 mm, or 2140 mm × 920 mm.

NOTE — The first dimension shall represent the length and the second width.

6.2 Thickness

The thickness shall be 3 mm, 4 mm, 6 mm, 9 mm, 12 mm, 16 mm and 19 mm.

NOTE — Any other dimensions (length, width and thickness) as agreed to between the manufacturer and the purchaser may also be used.

6.3 Tolerances

Tolerance on the nominal sizes of finished bamboo mat-veneer composite boards shall be as given in Table 1.

Table 1 Tolerances on Nominal Sizes of Bamboo Mat Boards

(*Clause* 6.3)

Sl No. (1)	Dimension (2)	Tolerance (3)
i)	Length	$^{+6}_{-0}$ mm
ii)	Width	$^{+3}_{-0}$ mm
iii)	Thickness	
	a) Less than 6 mm	± 10 percent
	b) 6 mm and above	± 5 percent
iv)	Edge straightness, *Max*	2 mm/m
v)	Squareness, *Max*	2 mm/m

Edge straightness and squareness shall be tested as per Annex B.

7 WORKMANSHIP AND FINISH

7.1 The BWP grade bamboo mat-veneer composite board shall be of uniform thickness within the tolerance limit specified in **6.3**. The surface shall be reasonably smooth and uniform in colour.

8 MECHANICAL REQUIREMENTS

8.1 The BWP grade bamboo mat-veneer composite boards shall conform to the mechanical requirements given in Table 2.

8.2 Three number of test specimens shall be taken for each test, except flammability, flame penetration and rate of burning, for which six number of test specimens shall be taken for each of the test.

Table 2 Mechanical Requirements of BWP Grade Bamboo Mat – Veneer Composite Board

(*Clause* 8.1)

Sl No.	**Property**	**Requirement**		**Method of Test, Ref to**
		Along the Grains of Outermost Veneer	Across the Grains of Outermost Veneer	
(1)	(2)	(3)	(4)	(5)
i)	Density, kg/m^3, *Min*	750		IS 1734 (Part 1)
ii)	Moisture content, percent	5 – 15		
iii)	Internal bond strength in dry state, N/mm^2, *Min*			IS 2380 (Part 5)
	a) Average	0.8		
	b) Individual	0.7		
iv)	Internal bond strength in wet state, N/mm^2, *Min* (*see* Note 1)			
	a) Average	0.6		
	b) Individual	0.5		
v)	Modulus of rupture, N/mm^2, *Min* (*see* Note 2)			IS 1734 (Part 11)
	a) Average	50	40	
	b) Individual	45	36	
vi)	Modulus of elasticity, N/mm^2, *Min* (*see* Note 2)			
	a) Average	5000	3500	
	b) Individual	4500	3200	
vii)	Tensile strength, N/mm^2, *Min*			IS 1734 (Part 9)
	a) Average	45	35	
	b) Individual	40	32	
viii)	Compressive strength, N/mm^2, *Min*			IS 1734 (Part 10)
	a) Average	35	30	
	b) Individual	30	27	
ix)	Resistance to ageing			
	a) Dry heat (*see* Note 3)	No surface defects and warping		–
	b) Ageing (*see* Note 4)			
x)	Resistance to fire			
	a) Flammability, min, *Min* (*see* Note 5)	25		IS 1734 (Part 3)
	b) Flame penetration, min, *Min* (*see* Note 6)	2t		
	c) Rate of burning, min, *Min* (*see* Note 7)	20		

NOTES

1 The prepared specimens shall be subjected to boiling in water for a period of 72 h and dried in ambient conditions till the specimens attain a moisture content of 10 to 12 percent. The dried specimens shall be tested in accordance with IS 2380 (Part 5).

2 Three test specimens from each direction (both lengthwise/along the face grains of outermost veneer and width-wise/across the grains of outermost veneer) for MOR and MOE from each sample of dimension as specified in IS 1734 (Part 11) shall be prepared.

3 Three test specimens of size 200 mm × 100 mm of the give thickness shall be prepared from each sample and kept at hot air oven at (70 ± 2) ºC for 168 h followed by cooling at (27 ± 2) ºC for 3 h. The specimens shall then examined.

4 Three test specimens of size 200 × 100 mm of the give thickness shall be prepared from each sample and subjected to seven cycles successively, each cycle consisting of the following operations:

- i) Specimen kept in hot air oven at (70 ± 2) ºC for 8 h.
- ii) Immersed in cold water at (27 ± 2) ºC for 16 h.

After completion of seven cycles, the specimens shall be dried in folds of blotting paper and then examined.

5 Flammability is measured as the time taken for second ignition. Continuous flame on the second specimen for 1 min shall be considered as second ignition.

6 t = thickness of specimen in mm.

7 Time taken to lose weight from 30 percent to 70 percent.

9 SAMPLING

The method of drawing representative sample and the criteria for conformity shall be as prescribed in IS 7638 corresponding to accepted quality level (AQL) 1.5.

10 ADDITIONAL REQUIREMENTS FOR ECO-MARK

10.1 General Requirements

10.1.1 The BWP grade bamboo mat-veneer composite board shall conform to the requirements of quality and performance as specified in this standard.

10.1.2 The manufacturer shall produce to Bureau of Indian Standards, the environmental consent clearance from State Pollution Control Board as per the provisions of the *Water* (*Prevention and Control of Pollution*) *Act*, 1974 and *Air* (*Prevention and Control of Pollution*) *Act*, 1981, and *Water* (*Prevention and Control or Pollution*) *Cess Act*, 1977 along with the authorization,if required under the *Environment* (*Protection*) *Act,* 1986, while applying for ECO-Mark appropriate with enforced rules and regulations of Forest Department.

10.2 Specific Requirements

The BWP grade bamboo mat-veneer composite board shall conform to the specific requirements given for ECO-Mark under relevant clause of the standard.

NOTE — The manufacturer shall provide documentary evidence by way of certificate or declaration to Bureau of Indian Standards while applying for ECO-Mark.

11 MARKING

11.1 Each BWP grade bamboo mat-veneer composite board shall be legibly and indelibly marked or stamped with the following particulars:

a) Manufacturer's name, his initials or his recognized trade mark, if any;
b) Nominal dimensions (length, width and thickness)
c) Date of manufacture;
d) Batch number; and
e) The criteria for which the BWP grade bamboo mat-veneer composite board has been labelled as ECO-Mark (in case the board has been marked with ECO-Mark) (*see Foreword*).

11.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
303 : 1989	Plywood for general purposes — Specification (*third revision*)
401 : 2001	Preservation of timber — Code of practice (*fourth revision*)
707 : 2011	Timber technology and utilization of wood, bamboo and cane — Glossary of terms (*third revision*)
848 : 2006	Synthetic resin adhesives for plywood (pnenolic and aminoplastic) — Specification (*second revision*)
1734	Methods of test for plywood
(Part 1) : 1983	Part 1 Determination of density and moisture content (*second revision*)
(Part 3) : 1983	Part 3 Determination of fire resistance (*second revision*)
(Part 9) : 1983	Part 9 Determination of tensile strength (*second revision*)
(Part 10) : 1983	Part 10 Determination of compressive strength (*second revision*)
(Part 11) : 1983	Part 11 Determination of static bending strength (*second revision*)
1902 : 2006	Preservation of bamboo and cane for non structural purposes — Code of practice (*second revision*)
2380	Methods of test for wood particle boards and boards from other lignocellulosic materials (*first revision*)
(Part 2) : 1977	Part 2 Accuracy of dimensions of boards (*first revision*)
(Part 5) : 1977	Part 5 Determination of tensile strength perpendicular to surface (*first revision*)
6874 : 2008	Method of tests for bamboo (*first revision*)
7638 : 1999	Wood/lignocellulosic based panel products — Methods of sampling (*second revision*)
13958 : 1994	Bamboo mat board for general purposes — Specification
14588 : 1999	Bamboo mat — veneer composite for general purposes — Specification

ANNEX B

(*Clause* 6.3)

METHOD OF TEST FOR EDGE STRAIGHTNESS AND SQUARENESS

B-1 PROCEDURE FOR EDGE STRAIGHTNESS

The straightness of the edges of bamboo mat-veneer composite board shall be verified against a straight edge not less than the full length of the bamboo mat-veneer composite board. If the edge on the end of the bamboo mat-veneer composite board is convex, it shall be held against the straight edge in such a way as to give approximately equal gap at each end. The largest gap between the straight edge and the edge shall be measured to the nearest millimetre and recorded.

B-2 PROCEDURE FOR SQUARENESS

The squareness of bamboo mat-veneer composite board shall be checked with a 1 200 mm × 1 200 mm square, by applying one arm of the square to the bamboo mat veneer composite board. The maximum width of the gap shall be recorded.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

Organization	*Representative(s)*
Indian Plywood Industries Research & Training Institute, Bengaluru	Dr Shakti Singh Chauhan (***Chairman***)
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